ECRONICON OPEN ACCESS

EC ENDOCRINOLOGY AND METABOLIC RESEARCH
Research Article

Working Conditions, Neighbourhood Deprivation and Quality of Life among People with Diabetes: A Cross-Sectional Study

Abdul-Razak Abubakari[1]*, Rosanna Cousins[2], Antony Morgan[3], Cecil Thomas[4], Dushyant Sharma[5] and Ebrahim K Naderali[2]

[1]*School of Health and Life Sciences (London Campus), Glasgow Caledonian University, United Kingdom*

[2]*Faculty of Science, Liverpool Hope University, Liverpool, United Kingdom*

[3]*Glasgow Caledonian University, London, United Kingdom*

[4]*Diabetes and Endocrinology, Aintree University Hospital NHS Foundation Trust, Liverpool, United Kingdom*

[5]*Diabetes and Endocrinology, Royal Liverpool University Hospital, Liverpool, United Kingdom*

***Corresponding Author**: Abdul-Razak Abubakari, School of Health and Life Sciences (London Campus), Glasgow Caledonian University, United Kingdom.

Received: May 04, 2020; **Published:** May 27, 2020

Abstract

Diabetes is a chronic metabolic disorder that requires constant management to maintain good health and quality of life. Poorly managed diabetes could lead to serious complications and early death. With the ageing demographic profile, there is growing recognition that older people, including those with diabetes, are increasingly becoming a significant proportion of the labour force leading to changes in pension and retirement-related policies. For people with diabetes, understanding how working conditions influence their health and wellbeing is an important step to addressing issues that could compromise their prolonged participation in the labour force. This study examined impact of job-strain on health-related quality of life among people with diabetes. A hundred and twenty-three eligible individuals with diabetes who attended two acute trusts, participated in the study. Diabetes specific quality of life, job characteristics and personal/disease characteristics were measured using questionnaires. Univariate and multivariate statistical analyses were undertaken using SPSS version-22. Over a sixth (17.4%) of participants reported poor quality of life. Marital/cohabitation status, type of diabetes and presence of other long-term conditions were associated with quality of life. High deprivation levels was associated with poor quality of life but there was no association between deprivation levels and participants' perception of the impact of diabetes on their quality of life. High psychological job-demands and physical job-demands were each associated with poor quality of life. High physical and psychological job-demands are potentially detrimental to quality of life in people with diabetes. Adjustments in working conditions could prove crucial in improving quality of life of employees with diabetes.

Keywords: *Quality of Life (QoL); Type-1 Diabetes*

Introduction

Diabetes is a chronic metabolic disorder that requires constant management to maintain best health and quality of life (QoL). Poorly managed diabetes primes other serious diseases and leads to early death. Whilst majority of people with Type-1 diabetes are diagnosed as children or in early adulthood, type-2 diabetes denies an accurate time of onset [1]. However, global figures estimate a prevalence of 8.8% in adults aged 20 - 79 [2]. It can be appreciated from this that there are millions of people of working age who have diabetes. Working conditions have been identified as a determinant of health [3,4]. There is some evidence for work-related psychosocial stress directly increasing the risk of developing diabetes [5] but this does not extend to all populations [6]. There is a dearth of robust evidence on the influence of working conditions on health-related QoL in people with diabetes.

Changes to the demographic profiles of most western countries means older people now make up a large proportion of their populations, and this has had a huge and direct impact on labour force participation. National governments have responded through policies to delay retirement. In the UK and elsewhere the default retirement age has been abolished and a system of incremental increases in pensionable age put in place to further reduce the forecast increase in the cost of state pensions for a population that is living longer [7,8].

These changes in pension-related policies will not yield the desired impact unless steps are taken to ensure that a sufficient proportion of the general population are able to work longer. Surely, simultaneous to the increase in life expectancy, there is an increase in the prevalence of chronic conditions [9,10]. If the central premise of extending working life is to be achieved, then understanding working conditions and how they impact on people with diabetes is important.

Working conditions are often assessed using measures of psychosocial and physical demands, social-support, and the level of control individuals have at work (decision-latitude). Job-demands are often considered together with decision-latitude as "job-strain" following Karasek's observation that it is the combination of these two variables that predict health outcomes. Specifically, high job-demands and low decision-latitude predicted work-related exhaustion and depression [11]. Whilst this early study had limitations, the general premise from Karasek's study remains. There is robust evidence of associations between job-strain and cardiovascular disease [12], hypertension [13], self-reported health status and depression [14].

There is no straightforward picture to understanding the decision to retire from work, although financial considerations are usually central [15]. To improve QoL has been considered a driver, but this too is complicated by judgements of relative benefits on various dimensions of well-being, of which income is only one part [16]. An empirical study which considered the time employees extended employment after pensionable age found that work-related characteristics were associated with the length of time people delay retirement. Virtanen., *et al.* [17] found that people with low job-strain were more likely to work longer after pensionable age, before retirement, than individuals who reported high job-strain. If pensionable age is to be further increased, then it is clear that perceived good health-related QoL will become even more relevant to being able to delay retirement. Thus, this study sought to examine the impact of job-strain of people with diabetes, and their health-related QoL, towards making recommendations which could influence retirement decisions.

Objective of the Study

Specific objectives considered in this study were to:

1. Investigate whether there are any associations between personal/disease characteristics and quality of life;
2. Explore relationship between neighbourhood deprivation and quality of life; and
3. Determine whether work-related characteristics (job strain) influence quality of life.

Materials and Methods

Some of the methods used in this study have previously been reported elsewhere. Postal questionnaires for the study were sent to addresses of eligible individuals with diabetes who attended two acute trusts in the North-West England. All adults with diabetes within the working age range (25 - 64 years), who received medical care from the two hospitals and provided consent were eligible to participate. Participants were asked to read a study information sheet and then sign a consent form prior to participation. Clinical data were obtained from hospital records and the 2010 index of multiple deprivation (IMD) data were obtained from the UK's Department for Communities and Local Government's (UKDCLG) Open Data Communities website [18]. The IMD is a population level composite measure of deprivation. IMD-2010 was constructed using a combination of information from seven socio-economic domains: Income, Employment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Crime and Living Environment [19].

A demographic questionnaire was used to collect information about participants' personal characteristics, including age, sex, marital/cohabitation status, educational attainment, ethnic-origin and employment status. Information about diabetes specific QoL was obtained using the Audit of Diabetes-Dependent Quality of Life (ADD-QoL) [20]. It is argued that the ADD-QoL is more tailored and allows diabetes patients to respond to items that are applicable to their individual circumstances. Compared to generic QoL tools, it is also sensitive, more

relevant and responsive to differences between groups of diabetes patients [20,21]. The ADD-QoL questionnaire assesses the perceived effect of diabetes on daily life-activities. It also contains two generic items: one assessing general QoL and the other assessing whether participants feel their QoL would have been much better or worse if they did not have diabetes. In other words, individuals' perceptions of the impact of diabetes on their QoL. The questionnaire has good psychometric properties including construct and discriminant validity and internal consistency reliability co-efficient of 0.95 [21].

The 49-item Job Content Questionnaire (JCQ) [22] was used to collect data about type, characteristics and content of participants' work. The JCQ is widely used to operationalise the Demand-Control-Support framework. Subscales within the questionnaire include job-control/Decision-Latitude (9-items), psychological job-demands (5-items), physical job-demands (5-items), job insecurity (3-items) and workplace social-support (11-items). Questions are scored in a 4-point likert scale: strongly disagree, disagree, agree and strongly agree. The JCQ has been used to investigate relationships between work-related factors and health outcomes including depression [23], cardiovascular disease and its risk factors [24,25].

Statistical analyses were conducted using SPSS version 22 (IBM SPSS). Prior to conducting substantive analyses, preliminary analyses were undertaken to investigate normality and other assumptions of parametric tests to inform the choice of appropriate statistical tests. Mean and standard-deviations are reported for continuous variables and percentages (number of participants) are reported for categorical variables. Depending on the type of variable, chi-square test of association, independent t-test or relevant correlation co-efficient was used to investigate univariate associations between variables. Logistic regressions were used to investigate to investigate associations between personal/disease characteristics, neighbourhood deprivation or work-related factors and QoL. Linear multiple-regressions were used to investigate multivariate relationships between predictor variables and continuous outcome variables. Both logistic and linear multiple-regressions adjusted for age and sex. The sample size requirement in this paper was based on the number of participants required to predict quality of life from the 5 components of job characteristics as independent variable: Decision latitude, Psychological demands, Physical demands, Job insecurity and Social support. Thus a minimum sample size of 90 was required based on the recommended 50+8m rule for multiple regression (where m is the number of independent variables) [26].

Ethical approval for the study was granted by North-East-Newcastle and North-Tyneside Committee-1 of the UK's National Research Ethics Service. The reporting in this paper is guided by the STROBE checklist for cross-sectional studies (See supplementary file 1).

Results

Overall, 123 individuals with diabetes participated in the study. Average age of participants was 49.85 ± 10.87 and over half (51.2%) of them were males. Forty-seven percent (n = 58) had type-1 diabetes and the rest had type-2 diabetes. As expected of most hospital-managed diabetes cases in the UK, 99% had poorly controlled diabetes (mean HbA1c = 44.39 ± 14.22) and over three-quarters were on insulin, either as single or combined treatment regime. Eighty percent (n = 97) of participants were in employment (i.e. employed or self-employed).

	a. General QOL		b. Effect of diabetes on QOL		c. AWI-QoL [Mean (SD)]
Personal/disease characteristic	**Bad quality of life [% (n)]**	**Good quality of life [% (n)]**	**Little or no effect on QOL [% (n)]**	**Much effect on QOL [% (n)]**	
Age group					
< 55	18.0 (11)	82.0 (50)	39.4 (26)	60.6 (40)	-2.56 (1.61)
55+	23.3 (10)	76.7 (33)	40.4 (21)	59.6 (31)	-2.72 (1.97)
Sex					
Male	19.2 (10)	80.8 (42)	33.3 (20)	66.7 (40)	-2.90 (1.71)
Female	21.2 (11)	78.8 (41)	46.6 (27)	53.4 (31)	-2.34 (1.79)
Marital/cohabitation					
Single/divorced/separate/ widowed	37.5 (12)	62.5 (20) **	41.0 (16)	59.0 (23)	-2.73 (1.97)
Married/cohabiting	11.3 (8)	88.7 (63)	40.3 (31)	59.7 (46)	-2.51 (1.62)

Type of diabetes					
Type 1 diabetes	11.3 (6)	88.7 (47) *	39.3 (22)	60.7 (34)	-2.68 (1.61)
Type 2 diabetes	26.5 (13)	73.5 (36)	41.7 (25)	58.3 (35)	-2.48 (1.85)
BMI category					
Not obese (healthy + over-weight)	15.0 (6)	85.0 (34)	34.1 (14)	65.9 (27)	-2.54 (1.77)
Obese	20.0 (9)	80.0 (36)	47.2 (25)	52.8 (28)	-2.62 (1.80)
Hypertension status					
Normotensive	14.7 (10)	85.3 (58)	45.3 (34)	54.7 (41)	-2.53 (1.68)
Hypertensive	26.7 (4)	73.3 (11)	23.5 (4)	76.5 (13)	-2.77 (2.09)
Mv complication status					
No mv complication	11.8 (4)	88.2 (30)	44.7 (17)	55.3 (21)	-2.48 (1.57)
Mv complication present	22.6 (12)	77.4 (41)	40.7 (24)	59.3 (35)	-2.60 (1.93)
Other long-term conditions Present?					
No	5.7 (3)	94.3 (50) ***	41.8 (23)	58.2 (32)	-2.22 (1.49)*
Yes	36.0 (18)	64.0 (32)	40.0 (24)	60.0 (36)	-2.99 (1.92)
IMD score (mean[± SD])	37.96 (5.13)	27.01 (2.34)*	29.61 (3.39)	27.99 (2.53)	

Table 1: *Personal/disease characteristics, quality of life and perceived impact of diabetes on quality of life. AWI-QoL: Average Weighted Impact of Diabetes on Quality of Life; IMD: Index for Multiple Deprivation; Mv: Microvascular; QOL: Quality of Life; *, p ≤ 0.05; **p ≤ 0.01; p ≤ 0.001.*

Personal/disease characteristics and quality of life

Three different aspects of QoL, as measured by the ADDQOL questionnaire, were investigated and reported in this paper: QoL in general (referred to here as QoL), perceived impact of diabetes on QoL and average weighted impact of diabetes on QoL (AWI-QoL).

More than two-thirds (68.6%) of participants reported good QoL but over a sixth (17.4%) also reported poor QoL.

Table 1 shows univariate associations between participants reporting good or poor QoL and specific personal/disease characteristics. Statistically significant relationships in QoL occurred in 3 areas: marital/co-habitation status, type of diabetes and whether or not participants had other long-term conditions. Married/cohabiting Participants were more likely to report good QoL than their non-cohabiting (single/widowed/divorce/separated) counterparts ($p < 0.01$).

People with type-1 diabetes perceived better QoL than participants with type-2 diabetes ($p < 0.05$). Also, people with additional long-term conditions apart from diabetes were more likely to report poor QoL compared to those who had only diabetes ($p < 0.001$).

In multivariate analysis, marital/cohabitation status and additional long-term conditions status significantly predicted QoL among participants, as shown in table 2, part-a.

Majority of participants (86%) reported that diabetes had negatively impacted on their QoL although a noticeable proportion (11.6%) also indicated it did not affect their QoL in anyway. In terms of the extent of effect on their QoL, 60% of participants thought diabetes greatly impacted on their QoL whereas 40% said it had little or no effect. As shown in table 1, part-b and table 2, part-b, there is no statistically significant association between any personal/disease characteristic and perceived impact of diabetes on participants' QoL

a. Quality of life				
Predictor variable	**B (SE)**	**Exp (B)-odds ratios**	**Lower 95% CI**	**Upper 95% CI**
sex	0.14 (0.75)	1.15	0.26	5.04
Age	0.05 (0.05	1.05	0.96	1.15
Marital status	-1.79 (0.90)	0.17*	0.03	0.97
Type of diabetes	0.34 (1.07)	1.40	0.17	11.35
Body Mass Index	0.03 (0.07)	1.03	0.90	1.18
Hypertension status	0.90 (1.02)	2.45	0.34	17.94
Microvascular complication present?	1.84 (0.98)	6.29	0.91	43.23
Other long-term condition present?	2.78 (1.06)	16.08**	2.01	128.84
Constant	-3.57 (4.38)	0.03		
Percentage correctly classified = 87.3; Hosmer and lemeshow (χ^2 = 11.04 p = 0.20); Nagelkerke R^2 = 0.35				
b. Effect of diabetes on quality of life				
sex	0.44 (0.47)	1.55	0.62	3.89
Age	-0.02 (0.03)	0.98	0.93	1.03
Marital status	-0.34 (0.53)	0.72	0.25	2.02
Type of diabetes	0.18 (0.66)	1.19	0.33	4.35
Body Mass Index	-0.03 (0.04)	0.97	0.90	1.06
Hypertension status	-1.03 (0.67)	0.36	0.10	1.31
MV complication present?	0.06 (0.49)	1.06	0.41	2.80
Other long-term condition present?	-0.53 (0.54)	0.59	0.20	1.71
Constant	3.06 (2.41)	21.32		
Percentage correctly classified = 55.8; Hosmer and lemeshow (χ^2 = 2.14 p = 0.98); Nagelkerke R^2 = 0.08				

Table 2: *Logistic regressions to predict quality of life from personal/disease characteristic.*
**, p ≤ 0.05; **p ≤ 0.01.*

AWI-QoL differed significantly between participants who had only diabetes compared to those who had additional long-term conditions as shown in table 1, part-c. Multiple-regression analysis confirmed the association between having additional long-term condition and AWI-QoL (B = -1.24, SE(B) = 0.43, β = -0.36, p > 0.01) but the model overall was not statistically significant (F = 1.42 df = 8 p > 0.05).

Neighbourhood deprivation and quality of life

Associations between neighbourhood deprivation (IMD scores) and each of the three aspects of QoL were investigated. As seen in table 1, low IMD scores, (high deprivation levels) were associated with poor QoL (rpb = -0.20, $p < 0.05$) but there was no association between IMD score and perceived impact of diabetes on QoL (rpb = -0.04, $p > 0.05$). There was also no statistically significant relationship between IMD score and AWI-QoL ($r = -0.13$, $p > 0.05$). As shown in table 3, logistic regressions analysis confirmed the association between neighbourhood deprivation and general QoL (odds ratio = 0.98, 95%CI 0.96 - 0.99).

Quality of life				
a. Predictor variable	**B (SE)**	**Exp (B) - odds ratios**	**Lower 95% CI**	**Upper 95% CI**
Age	-0.01 (0.03)	1.00	0.95	1.05
Sex	0.40 (0.52)	1.50	0.54	4.18
IMD score	-0.02 (0.01)	0.98*	0.96	0.99
Constant	2.25 (1.27)	9.49		
percentage correctly classified = 80.4; Hosmer and lemeshow ($\chi^2 = 7.21$ $p = 0.51$); Nagelkerke $R^2 = 0.08$				
b. Effect of diabetes on Quality of life				
Age	-0.03 (0.02)	0.97	0.94	1.01
Sex	0.68 (0.40)	1.97	0.91	4.27
IMD score	0.00 (0.01)	1.00	0.98	1.02
Constant	1.43 (0.93)	4.17		
percentage correctly classified = 62.1; Hosmer and lemeshow ($\chi^2 = 4.91$, $p = 0.77$); Nagelkerke $R^2 = 0.05$				

Table 3: *Regressions to predict quality of life from IMD score.*

**, $p \leq 0.05$.*

Regression analysis undertaken to investigate whether IMD score was associated with AWI-QoL also confirmed the result from the univariate analysis-i.e. no association between the two variables (B = -0.01, SE(B) = 0.01, $\beta = -0.17$ $p > 0.05$).

Work-related characteristics and quality of life

Associations between QoL and relevant measures of work-related characteristics are shown in table 4. QoL was found to be associated with psychological job-demands and physical job-demands. Compared to others, participants with high psychological job-demands tended to report their QoL as poor (mean ± SD = 38.88 ± 6.38 vs 32.34 ± 5.89, $p < 0.01$). Similarly, participants who reported higher physical job-demands were also more likely to report poor QoL compared to those who reported less physical job-demands (mean ± SD = 13.00 ± 3.46 vs 10.03 ± 2.96, $p < 0.01$). High physical job-demands was also associated with high AWI-QoL ($r = -0.24$, $p < 0.05$).

Logistic multiple-regressions to investigate whether work-related characteristics were associated with general QoL or perceived impact of diabetes on QoL did not find any statistically significant results (See table 5). Also, multiple-regression analysis conducted to determine whether work-related characteristics were associated with AWI-QoL did not find statistically significant results: decision-latitude (B = -0.01, SE(B) = 0.02, $\beta = -0.07$ $p > 0.05$), psychological job-demands (B = -0.04, SE(B) = 0.04, $\beta = -0.14$ $p > 0.05$), physical job-demands (B = -0.05, SE(B) = 0.08, $\beta = -0.10$ $p > 0.05$), job insecurity (B = -0.16, SE(B) = 0.14, $\beta = -0.14$ $p > 0.05$) and social-support (B = 0.12, SE(B) = 0.06, $\beta = -0.25$ $p > 0.05$).

	General QOL		Effect of diabetes on QOL		AWI-QoL (r)
JCQ scale	Bad quality of life mean (SD)	Good quality of life mean (SD)	Little or no effect on QOL mean (SD)	Much effect on QOL mean (SD)	
Decision latitude	74.00 (17.07)	70.83 (11.65)	71.79 (12.00)	70.57 (12.04)	0.01
Psychological job-demands	38.88 (6.38)	32.34 (5.89)**	32.32 (6.67)	33.22 (6.29)	-0.19
Physical job-demand	13.00 (3.46)	10.03 (2.96)**	9.61 (2.83)	10.76 (3.31)	-0.24*
Job insecurity	5.13 (1.96)	5.20 (1.40)	4.96 (1.22)	5.40 (1.57)	0.15
Social support	20.50 (3.16)	22.78 (3.93)	23.52 (3.00)	22.33 (4.31)	-0.20
Job-strain continuous	0.56 (0.17)	0.47 (0.11)*	0.46 (0.13)	0.48 (0.12)	-0.18

Table 4: *Working conditions and quality of life among participants.*

**, p ≤ 0.05; **p ≤ 0.01; QOL: Quality of Life; r: Pearson Correlation Co-Efficient; SD: Standard Deviation.*

Investigations were also undertaken using two different composite measures of job-strain: continuous and categorical/quadrant measures. The continuous index of job-strain was computed by dividing psychological job-demands by job-control whereas the categorical classification of job-strain was based on the quadrant method [22]. In univariate analysis, the job-strain (continuous) was associated with general QoL. Job-strain was significantly higher among those who reported poor QoL compared with those who reported good QoL (mean ± SD = 0.56 ± 0.17 vs. 0.47 ± 0.11, t(70) = 1.97; $p < 0.05$). However, no significant difference in mean scores of job-strain (continuous) was found for perceived effect on QoL (0.46 ± 0.13 vs. 0.48 ± 0.12, t(77) = -0.73, $p > 0.05$).

Job-strain categorical/quadrant was not associated with general QoL ($\chi^2 = 7.13$, $p > 0.05$) or perceived effect of diabetes on QoL ($\chi^2 = 2.86$, $p > 0.05$). There was also no statistically significant difference in mean AWI-QoL scores between participants in different categories/quadrants of job-strain, as determined through one-way ANOVA ($F(3, 79) = 2.20$, $p > 0.05$).

Further logistic regression analyses were undertaken to determine whether either of the composite measures of job-strain was significantly related with any of the three QoL measures. We found that neither measure of job-strain was significantly associated with general QoL or perceived effect of diabetes on QoL. However, job-strain categorical/quadrants significantly predicted AWI-QoL (B = -0.46, SE(B) = 0.19, β = -0.27 $p < 0.05$) (not shown in table).

a. Quality of life				
Predictor variable	B (SE)	Exp (B) - odds ratios	Lower 95% CI	Upper 95% CI
age	-0.11 (0.09)	0.90	0.76	1.06
sex	1.44 (1.28)	4.20	0.34	51.56
Decision latitude	-0.01 (0.04)	1.00	0.92	1.08
Psychological demands	-0.23 (0.14)	0.80	0.61	1.04
Physical de-mands	-0.14 (0.26)	0.87	0.53	1.44
Job insecurity	0.49 (0.38)	1.64	0.78	3.42
Social support	0.43 (0.23)	1.54	0.98	2.42
Constant	5.10 (7.47)	163.65		
Percentage correctly classified = 88.7; Hosmer and lemeshow ($\chi^2 = 8.66$ p = 0.47); Nagelkerke $R^2 = 0.05$				

b. Effect of diabetes on Quality of life				
age	0.01 (0.03)	1.01	0.96	1.06
sex	1.08 (0.56)	2.95*	0.99	8.78
Decision latitude	0.01 (0.03)	1.01	0.96	1.07
Psychological demands	-0.01 (0.06)	0.99	0.89	1.11
Physical demands	0.09 (0.11)	1.10	0.88	1.37
Job insecurity	0.13 (0.20)	1.14	0.77	1.68
Social support	-0.07 (0.09)	0.93	0.78	1.11
Constant	-0.89 (3.50)	0.41		
Percentage correctly classified = 64.2; Hosmer and lemeshow (χ^2 = 6.28 p = 0.62); Nagelkerke R^2 = 0.14				
*, p ≤ 0.05				

Table 5: *Regressions to Predict quality of life from working conditions.*

Discussion

Our study investigated QoL and whether it is influenced by neighbourhood deprivation or working conditions among people with diabetes. Similar to findings from other population groups [27] majority of participants in this study reported good QoL, although a noticeable proportion also reported poor QoL.

We found statistically significant associations between QoL and three areas of participants' personal/disease characteristics: Married/cohabiting participants were more likely to report good QoL than their single/non-cohabiting counterparts; people with type-1 diabetes perceived better QoL than their type-2 diabetes counterparts; and people with additional long-term conditions were more likely to report poor QoL compared to those who had no comorbidities. Two of these significant relationships, marital/cohabitation status and presence of other long-term conditions, were confirmed in multivariate analysis. Participants with additional long-term conditions also reported greater adverse impact of diabetes on their QoL compared to those who had diabetes only.

The findings on socio-demographic and disease predictors of QoL mirror observations in people with diabetes elsewhere [28]. For instance, in a systematic review to evaluate health-related QoL, Kiadaliri., *et al*. [28] found that most studies reported better health-related QoL in married compared to non-married (single/widowed) people. Similar results have also been reported in Greek people with diabetes [29] as well as in non-diabetic populations [27]. The report of poor QoL among participants with additional long-term conditions is understandable. Directly or indirectly, comorbidities have the potential to exacerbate the severity of diabetes and make management of the condition a little more complex. Thus, comorbidities are likely to have additional negative effect on the wellbeing of affected individuals [30,31]. People with type-1 diabetes reported less impact of diabetes on QoL compared to those with type-2 diabetes. In related investigations in UK and Australia other researchers reported greater adverse impact of diabetes on QoL for insulin-treated compared to tablet/diet treated patients [20,21]. However, these observations do not necessarily contradict our finding, as most participants in our study, regardless of diabetes type, were treated with insulin. Whilst there is no obvious explanation for our finding, it is possible that diabetes has become a norm for people with type-1 diabetes, as they might have lived with the condition since childhood or young adulthood.

Some of the differences in the findings between this study and other publications on similar topic could partly be explained by differences in data collection tools. For example, whilst we used the ADD-QOL questionnaire, other studies used generic tools such as

variants of the Medical Outcomes Study questionnaire (e.g. SF-36, SF-20) [32], the WHO-QOL or other tools [30] to examine QoL in diabetes populations. An advantage of using the ADD-QOL questionnaire is that it is more specific to diabetes. Moreover, the ADD-QOL provides weighting for individual items and enables researchers to identify areas of life that are important and relevant to individual participants [20].

In line with findings of other studies [21,28], most participants in this study (86%) reported that diabetes had negatively impacted on their QoL. Interestingly, a noticeable proportion (11.6%) of participants also reported that diabetes did not affect their QoL in anyway. Yet, 40% of the participants thought diabetes had little or no effect on their QoL. That said, it is not surprising for some patients to feel that diabetes has not adversely affected their lives. Indeed, research has shown that some people actually perceive a positive impact as a result of the positive lifestyle changes they adopt following diagnosis [20].

Higher neighbourhood deprivation was associated with poor QoL, but no statistically significant relationship was found between neighbourhood deprivation and perceived impact of diabetes on QoL. Most studies investigating QoL and income or socio-economic status, do so with individual level data. Such studies generally report association between low income/socio-economic status and adverse QoL outcomes among people with diabetes and therefore consistent with our finding [28,31]. However, it is worth noting that the deprivation index used in our study is a population/area level measure and reflects a combination of 7 socio-economic indicators within the neighbourhood [19].

Statistically significant associations were found between QoL and work-related characteristics. Specifically, compared to participants who reported less, those reporting high psychological job-demands or high physical job-demands were more likely to report poor QoL. High physical job-demand was associated with high AWI-QoL. Also, participants with high job-strain reported poor QoL. Indeed, adverse psychosocial work conditions are known to negatively affect health-related QoL in various populations [27,33]. To illustrate, Silva and Barreto [33] reported significantly poorer health-related QoL among Brazilian bank workers who had low control at work, in a study on psychosocial work conditions and health-related QoL. Rusli and colleagues [34] also demonstrated similar findings among automotive assembly workers. Their investigation found that high job-demands were associated with poor QoL, in relation to physical health and environmental domains, as well as high levels of stress [34].

There have been several studies projecting work stress, particularly, Job-strain, as a proven risk factor for type-2 diabetes [5,35]. There are also reports of relationships between working conditions and QoL in different population groups in the past. However, studies investigating this issue exclusively among people with diabetes are rare [23,36]. In an investigation of occupational stress among people with lifestyle related diseases, including people with diabetes, Inoue., *et al.* [23] reported that, participants with high job-demands were more likely to experience depression. This followed report of similar findings which had been published earlier [37]. The mechanism of the relationship between diabetes, depression and QoL is complex albeit poorly understood [38]. Depression is an important issue which influences the QoL of several population groups including those with diabetes. Yet, people with diabetes are more likely to experience depression and to report poor QoL [36].

Limitation of the Study

This study has limitations, and these should be taken into account when interpreting its findings. For instance, participants were recruited through convenient sampling and there is a potential for selection bias. Also, some of the multivariate analyses we undertook could not confirm the significant relationships observed in some univariate analyses. Perhaps, this is due to the limited power to detect small effect. We recommend further examination of the issues investigated in this study using a larger and more representative sample of people with diabetes. Future studies on this topic should include samples with a wider disease profile i.e. including recently diagnosed, and a wide spectrum of HbA1c profile. Perhaps, sampling participants from primary care would achieve this broad spectrum of people with diabetes.

Conclusion

Using empirical evidence, this paper demonstrates that psychological job-demands and physical job-demands are important work-related factors that influence QoL among people with diabetes. In order to promote and encourage their participation in the labour force, there is the need to identify and implement effective interventions to minimise or delay the onset of complications and improve QoL for people with diabetes and other long-term conditions. This underscores the need for healthcare professionals and employers to work together to enhance QoL for employees with diabetes. The findings that deprivation levels, socio-demographic characteristics and disease characteristics are also associated with QoL could potentially be used to guide interventions and provide tailored support for different groups of patients with diabetes. Finally, interventions to improve health outcomes for people with diabetes should make conscious efforts to assess patients' working conditions and, where appropriate, make necessary adjustments.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Funding Statement

This study was supported by a small grant from Liverpool Hope University.

Bibliography

1. NG Forouhi and NJ Wareham. "Epidemiology of diabetes". *Medicine* 42.12 (2014): 698-702.
2. IDF. "IDF Diabetes Atlas - 8th Edition". Brussels (2017).
3. N Dragano., *et al*. "Effort-Reward Imbalance at Work and Incident Coronary Heart Disease: A Multicohort Study of 90,164 Individuals". *Epidemiology* 28.4 (2017): 619-626.
4. ST Nyberg., *et al*. "Job Strain and Cardiovascular Disease Risk Factors: Meta-Analysis of Individual-Participant Data from 47,000 Men and Women". *PLoS One* 8.6 (2013): 4-9.
5. ST Nyberg., *et al*. "Job strain as a risk factor for type 2 diabetes: A pooled analysis of 124,808 men and women". *Diabetes Care* 37.8 (2014): 2268-2275.
6. MP Cosgrove., *et al*. "Work-related stress and Type 2 diabetes: Systematic review and meta-analysis". *Occupational Medicine* 62.3 (2012): 167-173.
7. D Pyper. "Employment: Retirement Age". London (2013).
8. P Feuerherd. "Why retirement age is 65 (and why it's getting higher)". JSTOR Daily (2017).
9. R Suzman., *et al*. "Health in an ageing world - What do we know?" *Lancet* 385.9967 (2015): 484-486.
10. World Health Organization [WHO]. "Ageing well must be a global priority Ageing well must be a global priority" (2014).
11. RA Karasek. "Job Demands , Job Decision Latitude , and Mental Strain : Implications for Job Redesign". *Administrative Sciences Q* 24.2 (1979): 285-308.
12. M Kivimäki and I Kawachi. "Work Stress as a Risk Factor for Cardiovascular Disease". *Current Cardiology Reports* 17.9 (2015).

13. GR Babu., *et al*. "Is hypertension associated with job strain? A meta-analysis of observational studies". *Occupational and Environmental Medicine* 71.3 (2014): 220-227.

14. Y Cheng., *et al*. "Association between psychosocial work characteristics and health functioning in American women: prospective study". *The British Medical Journal* 320.7247 (2000): 1432-1436.

15. M Turcotte and G Schellenberg. "Job strain and retirement". *Perspectives on Labour and Income* 6.7 (2005): 13-17.

16. N Steiber and M Kohli. "You can't always get what you want: Actual and preferred ages of retirement in Europe". *Ageing and Society* 37.2 (2017): 352-385.

17. M Virtanen., *et al*. "Extending employment beyond the pensionable age: A cohort study of the influence of chronic diseases, health risk factors, and working conditions". *PLoS One* 9.2 (2014).

18. UK Department for Communities and Local (UKDCLG). English Indices of Multiple Deprivation (2015).

19. UK Department of Communities and Local Government (UKDCLG). The English Indices of Deprivation 2010 Neighbourhoods Statistical Release (2011).

20. C Bradley., *et al*. "The development of an individualized questionnaire measure of perceived impact of diabetes on quality of life: the ADDQoL". *Quality of Life Research* 8.1 (1999): 79-91.

21. R Ostini., *et al*. "The audit of Diabetes-Dependent Quality of Life 19 (ADDQoL): Feasibility, reliability and validity in a population-based sample of Australian adults". *Quality of Life Research* 21.8 (2012): 1471-1477.

22. R Karasek., *et al*. "The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics". *Journal of Occupational Health Psychology* 3.4 (1998): 322-355.

23. N Inoue., *et al*. "A Simultaneous Evaluation of Occupational Stress and Depression in Patients with Lifestyle-related Diseases". *Internal Medicine* 55.9 (2016): 1071-1075.

24. NT Joseph., *et al*. "The Role of Occupational Status in the Association Between Job Strain and Ambulatory Blood Pressure During Working and Nonworking Days". *Psychosomatic Medicine* 78.8 (2016): 940-949.

25. M Kivimaki., *et al*. "Job strain as a risk factor for coronary heart disease: A collaborative meta-analysis of individual participant data". *Lancet* 380.9852 (2012): 1491-1497.

26. BG Tabachnick and LS Fidell. "Using multivariate statistics". 5th edition. Boston, MA: Allyn and Bacon/Pearson Education (2007): 980.

27. MA Teles., *et al*. "Psychosocial work conditions and quality of life among primary health care employees: a cross sectional study". *Health and Quality of Life Outcomes* 12.1 (2014): 72.

28. AA Kiadaliri., *et al*. "Quality of life in people with diabetes: a systematic review of studies in Iran". *Journal of Diabetes and Metabolic Disorders* 12.1 (2013): 54.

29. AK Papazafiropoulou., *et al*. "Diabetes-dependent quality of life (ADDQOL) and affecting factors in patients with diabetes mellitus type 2 in Greece". *BMC Research Notes* 8.1 (2015): 786.

30. W Redekop., *et al*. "Health-Related Quality of Life and Treatment Satisfaction in Dutch Patients with Type 2 Diabetes". *Diabetes Care* 25 (2002): 458-463.

31. PE Wändell. "Quality of life of patients with diabetes mellitus: An overview of research in primary health care in the Nordic countries". *Scandinavian Journal of Primary Health Care* 23.2 (2005): 68-74.

32. W Cheah., *et al*. "Perception of Quality of Life among People with Diabetes". *Malaysian Family Physician* 7 (2012).

33. LS Silva and SM Barreto. "Adverse psychosocial working conditions and poor quality of life among financial service employees in Brazil". *Journal of Occupational Health* 54.2 (2012): 88-95.

34. BN Rusli., *et al*. "Working conditions, self-perceived stress, anxiety, depression and quality of life: A structural equation modelling approach". *BMC Public Health* 8.1 (2008): 48.

35. H Sui., *et al*. "Association between work-related stress and risk for type 2 diabetes: A systematic review and meta-analysis of prospective cohort studies". *PLoS One* 11.8 (2016): 1-16.

36. H Sivertsen., *et al*. "Depression and quality of life in older persons: A review". *Dementia and Geriatric Cognitive Disorders* 40.5-6 (2015): 311-339.

37. K Kitaoka-Higashiguchi., *et al*. "The association between job demand, control and depression in workplaces in Japan". *Journal of Occupational Health* 44.6 (2002): 427-428.

38. N Inoue. "Stress and Atherosclerotic Cardiovascular Disease". *Journal of Atherosclerosis and Thrombosis* 21.5 (2014): 391-401.

Volume 5 Issue 6 June 2020